

NRAC

96-1



NAVAL
RESEARCH
ADVISORY
COMMITTEE

**VISITING PANEL
REPORT
ON THE
DEPARTMENT OF THE NAVY
SCIENCE AND TECHNOLOGY
BASE**

AUGUST 1996



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(RESEARCH, DEVELOPMENT AND ACQUISITION)
WASHINGTON, D.C. 20350-1000**

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**NAVAL RESEARCH ADVISORY COMMITTEE
VISITING PANEL**

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SCIENCE AND TECHNOLOGY BASE**

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DEPARTMENT OF THE NAVY S&T REPORT EXECUTIVE SUMMARY

PURPOSE OF STUDY

A special study of the Department of the Navy (DON) Science and Technology (S&T) Program was initiated in the summer of 1995 under the auspices of the Naval Research Advisory Committee (NRAC) at the request of the Assistant Secretary of the Navy for Research, Development, and Acquisition [ASN(RD&A)]. The Panel was asked to make recommendations to the DON relative to maintaining a strong and dynamic S&T base.

OBSERVATIONS

Science and technology played critical roles in the development of the most powerful Naval Force in the world. Over the last 50 years, the Office of Naval Research (ONR), the Naval Research Laboratory (NRL), and the Warfare Centers have been key players in the development of scientific and engineering advances that benefited both the DON and society.

The speed with which major technical advances are occurring has drastically increased, particularly in areas such as information technology, advanced materials, and biotechnology. While these advances often occur in academia, they are also substantially driven by the consumer and commercial industry, both at home and overseas. As a result, the defense community has become a net user rather than a net provider of advanced technology. The DON S&T program needs to be structured to give it access to technological advances occurring in industry. This will require that its S&T community continue to include some of the brightest scientists and engineers.

Federal policies regarding the governance of almost all Federal agencies impose excessive accountability and create employment and staffing obstacles to maintaining a strong S&T staff. The segmentation of R&D funding assignments within the Department of Defense into numerical categories (6.1, 6.2, ..., 6.7) leads to communication and administrative barriers that degrade effectiveness. These communication problems are especially serious between the DON S&T community (ONR, NRL) and the Fleet operations and requirements organizations (SYSCOMs and NO91).

RECOMMENDATIONS

Vision. An overall DON S&T vision is essential in order to guide the activities of its S&T community. This vision should clearly state the role of its S&T players and programs, including mechanisms for technology insertion and requirements feedback, within the context of the total Naval systems development, acquisition, and warfighting missions. The Panel recommends that ONR direct the long-term research programs (6.1-6.3), while the SYSCOMs and their Warfare Centers focus on applied research (6.4-6.7). To recognize the importance of the S&T program, the rank of the Chief of Naval Research should equal the rank of the System Commanders.

Reorganization Act of 1986 (which required the designation of a single acquisition executive in each Service and the separation of the acquisition function from the requirements function under the Chief of Naval Operations), the reduction of budgets, or the relocation of functions and personnel associated with the closing of certain operations, the work assignments of Naval personnel are constantly being restructured. It would appear that the people are doing their best, but it further seems that the systems have to be simplified and clarified in order that they can allow for a more effective mode of operation.

- F9. Within the Navy Department itself, rededication to improved practices holds promise for higher efficiencies, quality enhancements and reduced cycle times.
- F10. Although science and engineering are closely coupled and interactive, science is typically the product of scientists. Engineering is the product of engineers. Addenda B and C to this report detail the impact of Federal policies with regard to employment, compensation, etc. which are affecting the ability of the Navy and Marine Corps to attract and retain the optimum mix of the best science and engineering professionals. The inhibitors are gradually sapping the strength and the mix of professional personnel within the ranks of NRL, the Warfare Centers, and ONR.
- F11. Naval Warfare Center Technical Directors are not allocated adequate sums of discretionary R&D funding to pursue innovative research ideas within their respective technical areas.
- F12. The call for proposals and selection process for the Advanced Technology Demonstration (ATD) process is cumbersome. It appears to involve too much effort relative to the number of proposals ultimately selected.
- F13. The one-star rank of the Chief of Naval Research places ONR at a disadvantage within the military community and does not properly reflect the importance of S&T to naval warfare.

PANEL RECOMMENDATIONS

The recommendations follow the same categorization as the findings. However, the recommendations relative to Naval S&T Environment have been further separated into Communications, Industrial Involvement, University Involvement, and Navy S&T Components.

S&T Vision

An S&T vision from the Department of the Navy is necessary in order to guide the activities of the S&T community, both inside the Department and outside the Department.

- R1. The Department of the Navy should clearly state (or restate) its vision of the role of its S&T program within the context of the total Naval systems development, acquisition and warfighting missions. The Panel emphasizes the need for the fullest measure of support of long-term S&T investment by the Department of the Navy and by the Congress. The basic research component of ONR has been strong (although it could now be stronger). Action needs to be taken to ensure that it remains strong. Means should also be developed, through coordination with ONR, to demonstrate to the rest of the Department of the Navy the military value of a \$400M investment in the current 6.1 program. As part of this vision, the roles of the S&T players should be reaffirmed and clarified. We recommend the following:
- N091 be reconfirmed as the quarterback of the S&T charter but it is to be directed to establish and vigorously present Fleet requirements, rather than selecting and managing S&T.
 - ONR be given the unqualified charter to manage the 6.1, 6.2, and 6.3 programs, in an integrated fashion, always with a keen appreciation of the inputs and needs of others.
 - The PEOs and SYSCOMs steer the 6.4 - 6.7 funded programs with a greater emphasis on a more seamless lifetime of project transition to and including a cooperative interrelationship with projects with sufficiently clear definition back in the 6.2 and 6.3 stage of development for the trusting parties to matrix their roles. Science often is still the result of a single person, but technology development needs teamwork.
- R2. In the context of this new arrangement for S&T funding, the Department of the Navy should then direct its 6.1, 6.2, and 6.3 programs through the ONR, whose responsibility would be the senior institutional cognizance of the long-term programs, although other S&T professional's inputs regarding the long term should be sought. The focus on programs and projects designated as 6.4 through 6.7 should work through the SYSCOMs and their Warfare Centers.

Guidelines with substance should be ordained periodically as to funding amounts and proportions of funds for each category with a favorable disposition toward encouraging and protecting long-range comprise about 15% of the R&D funds for the Navy and Marine Corps. Under current budget limitations, reallocation within the 6.1 - 6.3 categories to achieve a more optimal mix is the best that can be achieved. The Panel believes that 6.1 is funded at about the right level (~30%) but that a rebalancing between 6.2 (~35%) and 6.3 (~35%) should be sought. In the past years, the 6.2 account was gradually reduced to feed the growing demands of the 6.3 program. As of now, the 6.3 program tends to be dominated by a small number of larger advanced technology demonstration projects. This has raised questions in many quarters regarding the efficacy of the current split. Increasing the level of 6.2 relative to 6.3 would allow many more trials of imaginative concepts with intrinsically higher risk, but carried out at a stage of development where the cost of failure need not be prohibitive. The remaining 6.3 funds should be more heavily focused in industry, in particular with those segments which have a track record of success, responsiveness and high rapidity. The net effect of such moves is to decrease the fraction of 6.1 - 6.3 funds at the Warfare Centers. This should be counterbalanced by utilizing the talents and expertise of the Centers in 6.4 - 6.7 where closer interaction with the Fleet and operational concerns is of paramount importance. The Panel believes that reallocation between accounts as well as changing the ratios of the numbers of various performers can lead to a more vibrant and successful S&T program.

In the past, ONR has not had sufficient staff to carry out the administrative burdens associated with the 6.2 and 6.3 programs. As a result, the Warfare Centers have been utilized to act both as surrogate program managers for these elements as well as carrying out administrative and contracting responsibilities. We advocate that ONR take on the responsibility for essential scientific and technical program management and oversight and that the Warfare Centers be used to provide administrative and contracting support to ONR for these programs. The advantages of this method of proceeding are that ONR headquarters would be able to carry out the planning and oversight of the complete spectrum of 6.1 through 6.3. This move also addresses the complaints of industry of being used to simply provide support to the Warfare Centers rather than the technical talents of the industrial community.

- R3. The 1946 statute that established ONR required the Chief of Naval Research (CNR) to have the same rank as the "Chiefs of Bureaus in the Navy Department." The validity and productivity of the Department of the Navy basic research program over most of the past 50 years provides ample evidence of the wisdom of this requirement. Unfortunately, in 1990, Congress eliminated this requirement. The rank of the senior Naval Officer in an organization is one measure of the relative importance of the work conducted by that organization.

The Department of the Navy should recognize the importance of the S&T program to its own future and return to the practice of assigning a Naval Officer to the CNR position that is equal in rank to the Commanders of the Systems Commands.

- R4. The Navy Department does a useful job of thinking ahead in many ways but it is proposed that there be a more intense application of the technique of roadmapping in a variety of the technologies to be employed.
- R5. Although the proportion of resources that could be allocated to the following would not be large, the Panel points out that there is a role for science and engineering to come up with solutions that are literally looking for a problem to solve. These may be in fields like biology, genetics, and others that on first reading would appear to be non-germane to the immediate needs of the Department of the Navy. The established leadership of the Navy and Marine Corps may naturally only see its needs based in context of what is currently known, yet scientists who are serving the Department of the Navy might imagine some new classes of applications of their less apparently germane sciences. Such insight might awaken a latent need of the Navy or Marine Corps for which there could then be promising investigation. The Department of the Navy should look primarily to academia for this.
- R6. Continuity of people who have a talent and a zeal for the discovery and the implementation of science-based solutions for the Navy and Marine Corps is important. Granted, that although the Department of the Navy has its own rotations program, and political changes do have their impact, there should be a purposeful elevation of a culture of striving for the involvement of more and more people, to and including uniformed people, having a sustained role in the stewardship of the S&T program. The elevation of rank of appropriate uniformed officers and positions of civilian professionals should be effected because of the deserving stature of science in the future of the Department of the Navy.

S&T Policies

Congressional policies should be reviewed, modified and/or set aside so that the Naval personnel and their contractors can more effectively employ the limited resources available to them to carry out Department of the Navy missions.

- R7. The Goldwater-Nichols provisions that separate the requirements and the acquisition responsibilities should be relaxed so that the offices of the Secretary of the Navy and the Chief of Naval Operations can more jointly work in the development of an S&T strategy and its implementation.

- R8. Various accountability obligations should be relaxed, not to the detriment of the taxpayer, but to moderate the cost and time demanded by accountability.
- R9. Various personnel policy issues as illustrated in the addendum documents (B and C) should be relaxed so that the quality of professionals available to the Navy Department within its organization will be uncompromisingly superior. (The need is a Government work force that is technically competent to take the input from the warfighters, from the scientific and technical community at large, etc. and objectively convert that into an R&D investment strategy that the system at large would be comfortable with, including those directly involved as investigators and designers).

Naval S&T Environment: Communications

Increased communication and coordination is required among the operating forces, the acquisition community, the S&T managers, and the "performer" community.

- R10. The management of the S&T planning and execution process must remain as close to the working scientists and engineers as possible.
- R11. As a mechanism to enhance communication between the military officers and the S&T community, cross-assignments in both directions are to be encouraged. A plan should be drawn up to include such assignments as a part of Naval careers.
- R12. We recommend the appointment of a 12-16 person mostly-in-house S&T Board made up of key players from the CINCs, OPNAV, PEOs, SYSCOMs, Marine Corps, Warfare Centers, NRL, NRAC, industry and academia. The members should be stimulators and innovators who also understand the Department of the Navy's mission, its requirements, and how S&T can be used to develop a "refreshed" Naval S&T vision. The purpose of the Board (which would report to the Secretariat) would be to interact closely with ONR to provide a formal communication link between ONR and the Department of the Navy's key S&T players and users. The S&T Board should be briefed at least once a year by ONR concerning its S&T vision and current program. After this briefing, the Board should report to the Assistant Secretary of the Navy, Research, Development, and Acquisition (ASN(RD&A)) with an assessment of ONR's S&T program.

Naval S&T Environment: Industrial Involvement

The present process of converting technology into products and services for use by the Department of the Navy takes far too long. Every possible effort should be made to reduce these intervals to be consistent with those in civilian industry and with the pace of evolution of the underlying technologies. It is recognized that complete implementation may not be feasible within constraints imposed on a Federal Government agency. Some of the industries on which the Department of Defense and the Department of the Navy depend are themselves not moving that rapidly.

This is particularly true regarding platforms (ships, submarines, aircraft, missiles, spacecraft, etc.). On the other hand, there are others, most notably electronic, computer and information technologies, where capabilities will evolve many times when measured in terms of platform evolution or replacement times. This is a classic multiple time-scale problem. It is obviously not possible for the Department of the Navy to introduce new platforms or weapons systems on a time scale that tracks with the advances of computer, information, or electronic technology. However, there is need to do a better job identifying those rapid technology advances that could be inserted quickly into existing platforms to ensure that the Department of the Navy is not employing equipment that makes it vulnerable to a technologically superior foe. There is a parallel need to design the platforms up-front to anticipate for the multiple technical configurations that must be expected during the platform's lifetime. During the whole life-cycle, risk-taking must be encouraged.

- R13. The Department of the Navy should attempt to make greater use of industry in all aspects of the development/procurement process, including exploratory development. It should also expand its relationships with industry sectors that are driving the leading edge of technology critical to the Navy and Marine Corps. The number of interfaces and hand-offs within the development/procurement process should be reduced to an absolute minimum. Ideally, a core team representing all the functions in the innovation process should be formed at the start of a development/ procurement project process and remain in charge and engaged until completion. To the extent that industry is to be involved in the process, industry should become a member of the team as early as possible, contributing to the design for manufacturability, produceability, reliability, maintainability, and affordability.
- R14. In order to maintain the defense industrial technology base, it should be a strategic objective of the Naval S&T program that at least 50% of the S&T funds are expended by industry and universities. These funds should be managed in such a way that industry feels that it is in a partnership with the in-house activities, and not in competition with them nor under the thumb of the in-house activity. It is equally important that these industrial investments be coordinated with and be synergistic with the in-house activities. The use of commercial specifications where they are equally acceptable to military specifications should be encouraged. The involvement of the high technology, high volume industries should be encouraged.
- R15. When a technology insertion target is identified, industry should be brought into the S&T program early during the engineering phase, so as to expedite the transition of technology into or out of the in-house programs. This implies that significant industrial participation should be expected in 6.3 technology demonstrations (and earlier, if possible). This depends, of course, on acquisition intentions and the cost-effectiveness of individual approaches.
- R16. The Naval S&T program should plan significant industrial efforts involving manufacturing technology and manufacturing process

development in order to lay the groundwork for rapid prototyping and the timely insertion of proven and available technologies.

Naval S&T Environment: Academic Involvement

The strategy for dealing with university involvement in the Naval S&T program should be straightforward. The universities collectively should be the largest recipient of the Department of the Navy's basic research funding. They have the principal responsibility for training future generations of defense scientists, engineers, program managers, etc. The individuals trained by the universities are the future talent of the entire Department of the Navy S&T infrastructure, be it in-house, industrial, or academic. The universities also have a principal responsibility for advancing the state of scientific knowledge, but little responsibility (or inclination) for adapting scientific knowledge, and engineering know-how to military use (except in times of national crisis). As part of the overall Naval S&T strategy, ONR should act as an attractive interface or an impedance transformer between the academic freedom of the university program and the translation of basic research results and new engineering know-how into addressing the needs of the Department of the Navy's S&T program. NRL, the Warfare Centers and industry should have principal responsibility for adapting (hands-on) the scientific knowledge and engineering know-how developed by the universities into useful military systems. The scope of the university program should be a corporate Department of the Navy decision. Its implementation should be carried out under the traditional ONR model that has served the Nation well for nearly fifty years.

- R17. The Department of the Navy has attained a reasonable balance between research funded in universities and research carried out in-house. It is important to retain that balance or something close to it. As a guideline, work funded in universities should focus on scientific/engineering disciplines critical to the Department of the Navy, while in-house work should be designed to provide the Navy and Marine Corps with the technology they need to support their missions.
- R18. The university-based Naval labs should play, not a dominant, but a significant role in the present 6.2 phase. These labs should use the talents of the best of the retired Navy and Marine Corps for advice, but they should remain university labs. Such an arrangement helps with being relevant, being taken seriously within the military establishment, and furthering the flow from research into the system.
- R19. We recommend the re-establishment of a number of SECNAV/CNO Chairs in areas of significant Department of the Navy interest. These Chairs would be awarded to outstanding academics for a specified period of time, and would include significant funding. These Chairs would also be expected to give several presentations within the research community (both academic and non-academic), and to be active mentors to graduate students and new faculty who are just beginning their interactions with the Department of the Navy through ONR activities.

- R20. The Department of the Navy should continue to strongly support the ONR Young Investigator Program to establish ties to outstanding new researchers who are beginning their academic careers.
- R21. The Department of the Navy should maintain the tradition of selecting a few qualified Navy and Marine Corps officers for advanced degree programs in key S&T disciplines at leading academic institutions and at the Naval Postgraduate School.

Naval S&T Environment: Naval Components

The Panel took note of two related questions. Should all 6.1 research be done in universities and the Government serve only the function of passing money to the universities? This doesn't recognize the fact that the Government needs to have competent trained scientists and engineers who are card-carrying members of the scientific community to make the investment decisions. Should the Navy and Marine Corps depend only on in-house research? This does not recognize that most of the intellectual vitality in research exists in the academic world. The proper solution is some balance. That balance should be a corporate Department of the Navy decision.

- R22. The Department of the Navy should retain its significant in-house laboratory capabilities in the form of its Naval Research Laboratory and its Warfare Centers. For the most part, these institutions have served Naval needs well. They must be allowed to serve with the finest cadre of professionals to contribute to the needs of the Fleet. The Department of the Navy and these organizations have usually demonstrated a balanced sensitivity to the assignment of work to university laboratories and to industry and should reaffirm their determinations to sustain this balance. Basic research should be restricted to mission requirements and projects of exceptional merit.
- R23. A important responsibility of ONR is to monitor relevant technical advances in industry and academia worldwide. The Warfare Centers and the PEOs should utilize commercially available technologies in a timely way.
- R24. While retaining responsibility for research of unique interest to its mission, the Navy and Marine Corps should seek opportunities to conserve resources by sharing or coordinating programs across the DoD in areas of common interest.
- R25. The oceanography program should be responsive to but not exaggerate the change in the threat environment from open ocean to littoral warfare. Similarly, the Department of the Navy should be responsive to but not over-emphasize numerical modeling at the expense of experimental and field work.
- R26. Practical experience with S&T is becoming more and more important in Navy and Marine Corps operations and it is important that Naval officers appreciate S&T. Therefore, as part of routine in-service training, Naval officers should be assigned to Naval S&T units (ONR, NRL, Warfare Centers).

ADDENDUM A

CURRENT IMPEDIMENTS TO EXECUTION OF THE NAVY'S SCIENCE AND TECHNOLOGY (S&T) PROGRAM

An integration of reports prepared by Richard Metry (Naval Surface Warfare Center), Thomas Payne (ONR), Annette Hartwig (ONR), and Kenneth Lackie (NRL)

The recently completed DoD Laboratory Infrastructure Capabilities Study (LICS) in the area of "Ships, Submarines and Watercraft", originally sponsored by Dr. Dorman and now under Dr. Lance Davis, identified several impediments to productive working relationships between various S&T suppliers (in-house labs/warfare centers, industry, and academia). These are described in the following:

a. Contracting/Outsourcing--Current Navy contracting procedures frequently result in long delays between the time that a need to outsource is identified and the time that a contract is signed. Navy contracting procedures should be more flexible and consistent with common industrial business practices. Specifically, there's a need to: increase local contracting authority; streamline the extensive system of audits and reviews; and reduce the Navy's involvement in contractor business practice.

b. Defense Business Operations Fund (DBOF) Business Practice Restrictions--"Fixed price" and "guaranteed completion-type contracts" are essentially prohibited which severely restricts the Lab's flexibility to accommodate joint venture initiatives. Full up-front payment to the Lab is also required rather than phased cost reimbursements which also restricts flexibility in accommodating collaborative-outsourcing initiatives. Several U.S. Codes need to be modified in order to eliminate these restrictions.

(1) Stabilized billing rate planning requirements under the Department of Defense DBOF Instruction inhibit prudent business practices. Labor rates are locked in too far in advance of actual performance and thus do not necessarily reflect current business requirements. DBOF procedures need to be modified in order to allow for changes in the business environment from one year to the next.

(2) Indemnification requirements under DBOF are grossly one-sided, highly restrictive and contrary to commercial business practices. These requirements need to be changed in order to make DBOF governed organizations more attractive when it comes to providing services to the private sector.

c. Facility Cost Competitiveness--Under a current DoD Instruction, Navy Maritime RDT&E test facilities are required to apply a surcharge to the cost of work for private parties. Public Law 103-160, which provides for the exemption of the "surcharge" for Major Range and Test Facility Base (MRTFB) activities, does not currently include the U.S. maritime primary hydrodynamics "national assets" at NSWC, Carderock Division. Making these national assets part of MRTFB will help to make them more

attractive for private sector use. However, the competitiveness of these facilities is also negatively impacted by the availability of foreign test facilities which are subsidized by their governments driving U.S. technology resources overseas. Some initiatives are required to neutralize the adverse effect of these subsidies and thus make the hydromechanics facilities more competitive.

d. Intellectual Property Rights--Intellectual property rights of private sector firms are not fully protected when government funded assets are utilized in collaborative or private party work agreements. Unlike "technology transfer" which is subject to special congressional legislation, no clear legislative or regulatory basis exists for industry retention of intellectual property rights for routine collaborative or private party work agreements. This inhibits a government activity's ability to enter into these types of agreements.

e. Administrative Controls and Risk--Controls and oversight on the S&T programs has become stifling. How much you can spend on what, by when, and for what very precise purpose are attributes inconsistent with flexibility. Furthermore, it is refreshing that many development and acquisition managers and offices are recognizing S&T as important to their products; however, they bring a risk intolerant set of expectations and criteria to the environment. This can be counterproductive, and indeed is consuming our scientists and technologists time.

f. ONR implemented science oriented approach to S&T: The system focus, which was provided by the ONR 6.2 and 6.3 organizations has been diluted.

g. Flexibility to provide that is stifled by the lack of investment capital and decision authority. Much of this stems from lack of senior advocacy in the Navy infrastructure. Anticipation of future needs and timely commitment has been a strength which must continue.

h. Over-control is a manifestation of a general emphasis on compliance, rather than mission execution. For years, the system has responded to problems by imposing additional rules, reporting requirements, and audits on entire enterprise. In general, the DoD system does not trust its employees or suppliers to do the right thing. Consequently, there is very little room for discretion left to the individual manager or employee, who must continue to try to make a positive contribution in a system that is overburdened by controls. As the Navy continues to shrink its workforce, the effectiveness of this overburdened system will deteriorate.

(1) This attitude of non-trust begins with Congress, and includes dividing RDT&E funding into Categories. Each of these accounts must be separately accounted for and described annually to Congress. Transfers cannot be executed without the permission of Congress but should be more liberally allowed.

(2) The amount of supplementary data requested by Congress has significantly increased in the past ten years (although there has been

some relief in the past two years). ONR typically provides over 350 pages of written material to Congress on the Navy S&T program each year, and also briefs the staffs of four different Congressional committees. Inputs usually provoke requests.

(3) Of late, most questions from Congress center around proposed Congressional plus-ups to the budget (mostly Member-interest items). For every proposed Congressional increase or earmark, ONR must answer a standard set of questions. For FY95, out of \$1,539M appropriated for Navy S&T, \$235M was for Congressional earmarks or plus-ups. Additional documentation involves the preparation of point papers for each earmark/plus-up, which then must be coordinated with the Navy and/or OSD Comptroller staffs to gain the release of funds. ONR must also respond to Congressional inquiries regarding the status of the funding.

(4) Some of the effort devoted by N091 to formulation of the Navy S&T budget/POM overlaps with the same functions performed by ONR. Some of this duplication results from Goldwater-Nichols, and some probably comes from a natural bureaucratic tendency to review everything crossing one's desk.

(5) Audits: ONR, NRL and the other S&T performers are audited by the General Accounting Office, DoD Inspector General, and Navy Audit Service (NAS). The number of audits which involved ONR has increased significantly over the past few years.

| <u>YEARS</u> | <u>AUDITS PER YEAR</u> |
|--------------|------------------------|
| 1988-90 | 10-15 |
| 1991-92 | 20-25 |
| 1993-95 | 45-60 |

Most audits last a year or more, and information requests or requirements may be continuous or sporadic during the course of the audit.

(6) The recently passed Chief Financial Officer's Act has placed increased emphasis on timely accounting and financial reporting. As a result of this statute, ONR now receives more requests for financial data, and has more people looking over their shoulders. Unfortunately, money has not been available to either replace antiquated equipment or tie Navy financial systems together electronically. The result is that the ONR (and much of DoD) financial system uses paper for most transactions, and cannot respond quickly to the increasing number of requests.

ADDENDUM B

MANAGING PERSONNEL IN THE WARFARE CENTERS by Ira Blatstein (Naval Surface Warfare Center)

INTRODUCTION

On 2 January 1992, the Navy formally established four Warfare Centers through the consolidation of some 36 separate activities with missions in research, development, test and evaluation (RDT&E), engineering, and fleet and industrial support. They were created to act as the in-house technical arms of the hardware Systems Commands (SYSCOMs) with which they are aligned by mission. As such, Warfare Centers perform an integral role in assisting their parent SYSCOMs in meeting the Navy's overall material support needs. Within these Centers resides a unique reservoir of intellectual capital that, together with a diverse complex of laboratories, test ranges and other facilities, can be employed throughout the several phases of acquiring and supporting warfighting capability for the Navy's operating forces.

At the close of FY 1994, these Centers collectively employed approximately 49,300 full-time permanent (FTP) civilians of whom about 42.4 percent were scientists and engineers (S&Es). These numbers represent a reduction from end of FY92 levels of 11.3 percent of total FTP civilians and 5.6 percent of S&Es. These reductions have been largely effected through a series of hiring restrictions, some imposed at the OSD level, others the result of internal Navy policy decisions. They have ranged from reductions in the number of employees each Warfare Center can hire, to at times, total freezes on all hiring with but a few exceptions for personnel deemed essential for health, safety and security reasons. Consequently, most Warfare Center personnel reductions to date have been attrition-based, driven largely by hiring constraints and retirements, with many of the latter encouraged by separation incentives or "buyouts." As yet, there have been few reductions through exercising Reduction-in-Force (RIF) procedures, a situation that could change.

Hiring restrictions, now in place for several years, have had a demonstrable impact on Warfare Center workforce demographics. Particularly noticeable is the decline in the number of young (ages 20-30) S&Es. OCPM data indicate that, at the end of FY 92, this category represented the largest sub-group of civilian S&Es in the Warfare Centers, some 33 percent of total. However, by the end of FY 94, this sub-group represented only about 15 percent of total civilian S&Es. Importantly, data for this same time period indicate that, despite retirements and the use of various separation incentives, the number of Warfare Center S&Es over 50 years of age increased from 15 percent (end FY 92) to just under 19 percent (end FY 94). That is, nearly one in five Center S&Es is still at or nearing eligible retirement age, and this despite an already significant loss of senior technical talent through retirements.

Discussion

Doubtless, infrastructure reductions, including personnel drawdowns, will continue for several more years. The Warfare Centers themselves are already well along this path and expect a civilian drawdown of approximately 32 percent over the period FY 91 - FY 01, representing almost 21,000 positions. At the same time, the Navy's future continues to depend upon retaining the knowledge base necessary to develop, acquire and support technologically superior Navy and Marine Corps Systems. This point was strongly emphasized in the 24 Feb 1995 DoD response to NSTC/PRD #1, Presidential Review Directive on an Interagency Review of Federal Laboratories which stated, *"Technological superiority of weapon systems is a basic premise of U.S. military capability. Thus the RDT&E infrastructure -- people, facilities and equipment -- must be at the top of their league."*

In the Navy, much of this knowledge base currently resides in the scientific and technical personnel of the Warfare Centers. As these Centers continue to downsize and concentrate on core capabilities and requirements for the future, this knowledge base must be preserved. This requires a continuous infusion of new technical talent; however, attrition-based downsizing is antithetical to such an infusion. The DoD response to NSTC/PRD #1 succinctly summed up the situation as follows: *"...under current regulations downsizing exacerbates the talent problem. As DSB noted [reference is to the Apr 94 Defense Science Board Task Force on Lab Management] attrition, stimulated by early retirement incentives, eliminates a significant portion of the most experienced workforce ... RIF procedures are employed for further downsizing; but RIF "bump" rules effectively eliminate the newest arrivals. Recent graduates in [S&E] positions...are being lost. Experience and new ideas are lost simultaneously; and quality plays no real role in the process. Hiring and grade freezes during federal downsizing ... eliminate new talent and promotions for the most promising performers. When hiring is permitted, priority placement rules can bring back RIF'd personnel (often from non-R&D organizations) who simply meet the minimum position qualification standards. Finally, "full-time-equivalent" (FTE), the primary size constraint, includes most students, intergovernmental personnel act employees, and other temporary scientific and engineering personnel who are used by the labs to bring in new ideas and transfer knowledge and technology. The bottom line impact on the DoD labs, under current rules and procedures, will be a major talent drain with virtually no infusion of new blood for nearly a decade."*

What is becoming increasingly clear, therefore, is that the concurrent application of multiple personnel constraints, such as those mentioned above, makes the job of retaining an appropriate base of technical talent in the Warfare Centers, while continuing to downsize, extremely difficult. This situation is further aggravated in activities which operate on a customer-reimbursable basis such as the Defense Business Operations Fund (DBOF). DBOF activities are expected to generate sufficient revenue each year to offset their costs and therefore achieve a zero Net Operating Result (NOR). To accomplish this, each Center must perform a certain number of direct work years. However, FTE controls coupled with

hiring constraints, which limit the Centers' ability to replace workers lost during the operating year, combine to make achievement of a zero NOR nearly unattainable.

Conclusion and Recommendations

If current approaches to personnel downsizing in the Warfare Centers are maintained, the technical talent base, and ultimately the capability of these Centers to perform their assigned tasks, will suffer continued erosion. This issue has already been noted as demonstrated by the previously cited DoD response to the NSTC/PRD #1. It has also been raised in the Navy where, for example, the October 1994 report of the Naval Research Advisory Committee report on Naval R&D commented, *"as downsizing continues, without infusion of new talent, and with separations based more on length of service than function or skill, there is a real likelihood that serious skill imbalances will result and that vital knowledge bases will unnecessarily erode."* Clearly, this issue is important and is already commanding the attention of Warfare Center managers and their superiors in the SYSCOMs as well as others in the Navy. However, final resolution extends beyond the collective authorities of those cited and, as yet, no complete solutions have been found. It is therefore recommended that:

- SECNAV explicitly state Navy's policy is to have a technical and support workforce of excellence, second to none, albeit smaller.
- One of the primary vehicles for achieving a workforce of excellence is the Laboratory Personnel Demonstration Project, which should be vigorously supported.
- That Navy Center managers be afforded other latitude to explore efforts such as:
 - Redefinition of FTE to exclude temporary S&E personnel, students, post-doctoral scholars, and other similar temporaries.
 - Flexibility in the application of the Priority Placement Program.
 - Flexibility for the Centers' managers to manage personnel to technical workload.
 - Use of BRAC closing site personnel savings to offset some expanded hiring authority at remaining warfare center sites.

ADDENDUM C
HUMAN RESOURCE MANAGEMENT
by
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The problems DoD laboratories and other Federal Government R&D activities have experienced with the recruitment, compensation, and retention of scientists and engineers (S&Es) have been amply documented in a number of blue-ribbon studies and reports, including the Packard report, the Grace Commission report, and the Fowler Report. In all of these reports, there is a common element regarding the problems that exist in the Federal laboratory community: the Federal personnel system limits the ability of laboratory management to attract and retain the best personnel at a reasonable cost. For several decades NRL and other government-operated R&D organizations have been experiencing fierce competition with academia and industry for S&Es.

The following describes some of the specific problems experienced at NRL:

a. **External Controls on Human Resources Management.** Without question, the various hiring freezes and end-strength and high-grade limitations that have been imposed on the Department of the Navy (DoN) and Department of Defense (DoD) activities in recent years have severely limited the Laboratory's ability to hire and retain a diverse, high-quality technical staff. NRL has been under one or more freezes, in one form or another, almost continuously from 20 November 1987 to 30 September 1994 (and is still under a high-grade ceiling and a full-time equivalency control).

The impact of controls focused on restricting outside hires, is particularly severe on an R&D organization like NRL, since the recruitment pool for S&Es with skills appropriate to the NRL mission are difficult to find within other DoD organizations. During the FY-1988 to FY-1994 period, NRL's total population (not including its Mississippi site, which merged with NRL in 1992) declined by over 500 employees. During this same period, the NRL business base increased by \$260M. Since not all of these dollars were targeted to be outsourced, the internal base also increased.. Therefore, the overall decline in personnel over this period was due more to controls on the positions than to lack of funding. (However, there have been specific areas of NRL research [such as deep-water anti-submarine warfare] which have suffered reductions because of reduced funding.) The hiring freeze, in particular, made it very difficult to staff in critical areas. In addition, recruitment of S&Es with advanced degrees typically requires six to nine months (to locate, recruit, obtain approval, and complete the required process). The imposition of a freeze normally terminates all ongoing recruitment actions immediately (except those in which a job offer has already been made). Therefore, the many months expended in recruiting highly specialized scientists is, in many cases, lost when a freeze is imposed. On the other hand, the removal of a freeze simply permits the recruitment and approval process to begin again, and produces no sudden influx of new hires that can be brought on board before the next freeze is imposed.

High-grade ceilings, promotion freezes, and lengthy approval processes for senior-level positions can be almost as disruptive to the Laboratory's retention efforts as hiring freezes are to its recruitment endeavors. Despite NRL's record of achievement in retaining good S&Es, some people simply will not wait for years until a death or retirement opens up a high-grade level slot or until the cumbersome Senior Executive Service (SES) and Scientific and Technical (ST) billet authorization process is completed. In many instances, it takes over two years (in one case it was five years) to obtain a new ST billet for promotion of a highly deserving, world-renowned scientist to the top level of his/her career path.

The lengthy and cumbersome process for approval of SES and ST positions inhibits NRL's ability to compensate its senior managers and scientists commensurate with their responsibilities. As research requirements change, NRL needs to be able to restructure the assignments of its senior managerial and scientific resources within the number of positions allocated by higher authority. Granting this flexibility would allow NRL to adapt quickly to changing requirements, to recognize deserving managers and scientists.

b. **Recruitment.** Private industry and academia are the principal recruiting sources for S&Es at NRL. Over the last three years, 85 percent of NRL's newly hired S&Es came from outside the Federal Government. Under existing recruitment regulations, NRL finds it extremely difficult to make timely offers of employment to hard-to-find S&Es with the skills needed. Even when a candidate is identified, he/she often finds another opportunity before the recruitment process can be completed. The average time to complete a competitive nationwide recruitment of an S&E is approximately 140 days (when a suitable candidate can be found with just one advertisement).

In some technical fields, the limited pool of U.S. citizens with the proper credentials can necessitate the recruitment of non-citizens. The time required to gain approval to recruit a non-citizen is usually six months to one year. Such lengthy procedures can seriously delay ongoing R&D programs and cause critical delays in the development of urgently required military systems.

One study report, the Final Report of the Working Group on Federal Laboratory Personnel Issues, summarizes the R&D recruitment problem as: "Restrictions on an activity's ability to make on-the-spot job offers to candidates for scientific and engineering positions in the laboratories hamper recruitment efforts and result in the loss of many highly qualified potential employees." Additional delays in the merit staffing process are caused by the current requirement to rate and rank all candidates for promotion in order to identify the highly qualified group. Identification of a highly qualified group when there is only a small number of candidates is a waste of time and resources. Direct hire authority, under which NRL has been granted authority to hire employees without Office of Personnel Management (OPM) approval of individual actions, reduces the recruiting time somewhat. Unfortunately, direct hire authority has been granted to NRL only for a limited number of occupations and has been withdrawn by OPM in some cases.

c. **Compensation.** Much has been said and written about the problems associated with the Federal classification system and the Federal pay scale. The Grace Commission Report stated that the overall quality of "...staff in R&D laboratories is declining..." and "...current Federal pay schedules significantly handicap the laboratories in recruiting and retaining well-qualified scientists and technicians." The Fowler Report identified the Federal pay scale as "...a major inhibitor to attracting and maintaining quality technical staff..." in Federal laboratories. It went on to identify a difference of \$14,000 [in 1987] in the mean salaries of the Federal laboratories' S&Es and their higher-paid counterparts in non government laboratories. Over the last three years, approximately 48 percent of the S&Es hired by NRL above the GS-7 level were hired at an advanced in-hire rate under the superior-qualifications criteria. The salary disparity is attributable, in part, to inflexible compensation rules and a government-wide classification system that does not easily keep pace with changes in occupations and technology. Changes in the occupational job market are slow to be reflected in the Federal pay scale, particularly when the changes apply only to limited occupations.

The current classification system is cumbersome and prevents NRL from compensating its employees at a level comparable to academia and private industry. It also limits NRL's ability to create the flexible organizational structures necessary to accommodate R&D program requirements. For NRL to retain its exceptional record of technological contributions to national defense, the Laboratory must be able to attract, retain and reward those S&Es with extraordinary technical credentials and international reputations for achievement. Comparable compensation is a necessity in order for NRL to compete with private industry for top creative talent. Compensation levels are generally too low for both entry-level and senior-level positions. However, the rigid nature of the current GS system also over- compensates some disciplines that are in low demand.

d. **Performance Management.** As a world-class laboratory, NRL has a continuing need to recruit professionals with extraordinary creativity and technical credentials. NRL personnel have a reputation both for scientific achievement and the ability to apply their discoveries to the development of militarily relevant systems and technologies. Recruiting such a staff is a continual challenge and is made much more difficult by the cumbersome Federal General Schedule.

NRL must have the means to motivate and reward employees for their creative contributions and to ensure that the creative process is continually renewed. Compensation levels must be directly linked to the levels of individual contributions/performance. High contributors must be rewarded both to encourage their continued contributions and to ensure their retention at NRL. Similarly, lower-performing individuals should receive less compensation, or (in some cases) be encouraged to seek other employment. Contributions-based compensation systems are widely used in industrial R&D organizations and Federally Funded Research and Development Corporations, and would permit more flexibility in performance management and improved connectivity between an employee's value to the organization and his/her compensation.

e. **Performance Actions.** NRL has an outstanding international reputation as a research laboratory. That reputation is built on the individual achievements of its employees, many of whom have established themselves as world-class S&Es. If the level of contribution of an employee drops below their level of compensation for a significant period of time, NRL needs to have a non-stigmatizing way to limit or reduce compensation, move the individual to a different career orientation, or, if necessary, remove the employee.

The current systems for handling performance-related actions are cumbersome and time consuming, and are often perceived by managers and supervisors as unacceptably burdensome. In many instances, supervisors are reluctant to initiate a performance action, because they believe that the employee should not be unduly stigmatized when their performance might be quite acceptable in another situation. For NRL to maintain its stature in the scientific community, its S&Es must maintain a high level of creativity and productivity. New streamlined procedures, along with appropriate incentives such as severance pay, are needed to deal with employees whose contributions have dramatically decreased and who probably need a change of focus.

f. **Review of Actions.** The current system of review of actions, both performance and adverse types, is inordinately cumbersome and costly. Adverse actions are taken under 5 CFR Part 432 (performance-based) or 5 CFR Part 752 (performance or conduct-based), and may be appealed by the employee to the Merit Systems Protection Board (MSPB). NRL's proposed contributions-based separation introduces a more streamlined procedure for dealing with employees whose contributions have diminished (as discussed in the previous paragraph), and will not fall under 432/752. Therefore, MSPB will have neither a charter to review such actions nor expertise in doing so. An additional appeal route to MSPB for these actions should not be created. Further, through the new procedures NRL will be offering a separation alternative which has considerable advantages to employees when compared to traditional approaches (under Parts 432 or 752). The advantages to NRL of offering this alternative are greatly reduced without the ability to limit MSPB reviews.

Partially in response to the problems identified by the blue-ribbon panels, Congress passed Section 342 of the National Defense Authorization Act for Fiscal Year 1995, authorizing the Secretary of Defense to carry out personnel demonstration projects at DoD science and technology reinvention laboratories. The Act requires that each demonstration project "be generally similar in nature to the China Lake demonstration project."

The human resources management demonstration project that the Naval Research Laboratory (NRL) proposes to conduct under this authority will allow the Laboratory to hire, retain, and compensate the highest quality scientists and engineers (S&Es) in order to maintain its record of scientific achievement and contributions to national defense.

The NRL demonstration project has five objectives:

a. **Provide NRL with the authority to manage its human resources consistent with its operation as an industrially funded activity.**

b. Provide a recruitment process that would enable NRL to recruit and hire the best qualified individuals.

c. Provide a compensation system that would enable NRL to provide salaries to all its employees that are both equitable and competitive with the R&D market place.

d. Provide a performance appraisal system that directly links compensation to contributions to the organization.

e. Provide a non-adversarial mechanism to reduce the pay or separate personnel who fail to maintain appropriate levels of performance.

Major changes proposed under the NRL demonstration project include:

a. Management Authority.

(1) Elimination of externally imposed hiring, high-grade and end-strength limitations, and permit the Laboratory to manage its human resources within financial constraints.

(2) Management by NRL of SES and ST positions within allocations established by higher authority.

b. Hiring.

(1) Delegation to NRL of direct-hire authority for all occupations, establishment of a single appointing authority, establishment of competency-based qualification requirements, and extension of the probationary period to three years.

(2) Authorization for NRL to hire retired military members without regard to the 180-day post-retirement limitation.

c. Pay and Compensation.

(1) Establishment of a single, integrated pay schedule that extends from GS-1, Step 1 to Executive Level III (currently limited to Executive Level V) with market-sensitive occupational salary ranges within this pay schedule.

(2) Establishment of a singly pay pool for all non-SES personnel that would consolidate comparability increases, locality pay, within-grade increases, quality step increases, performance awards, promotions, and other discretionary funds available; and elimination of the separate pay actions formerly required.

d. Performance Management.

(1) Establishment of a contributions-based compensation system that directly links pay to performance.

(2) Establishment of a mechanism to reduce the pay (in a non-adversarial manner) or automatically terminate employees who fail to maintain an appropriate level of performance for a specified period of time.

e. Separations.

(1) Authorization of the use of early retirement (for those eligible) or severance pay (for those not eligible for early retirement) for employees being terminated.

(2) Limitation of reviews of contributions-based, performance-based, and adverse actions, subject to due process, to within NRL.

(3) Establishment of a RIF system that modifies the weights of veterans preference, length of service, and high performance; and limits competition to one round.

Supplementary statement on Civil Service Personnel System. The personnel requirements of an R&D establishment are not the same as those of the Internal Review Service, a supply depot, etc. There is an opportunity to make some modest improvements by using the legislative authority provided in the FY95 Defense Department Authorization Act. This statute allows the creation of several personnel demonstration projects at DoD R&D activities (including NRL and the Warfare Centers). The Panel encourages at least the full exploitation of the authorities provided in this legislation.